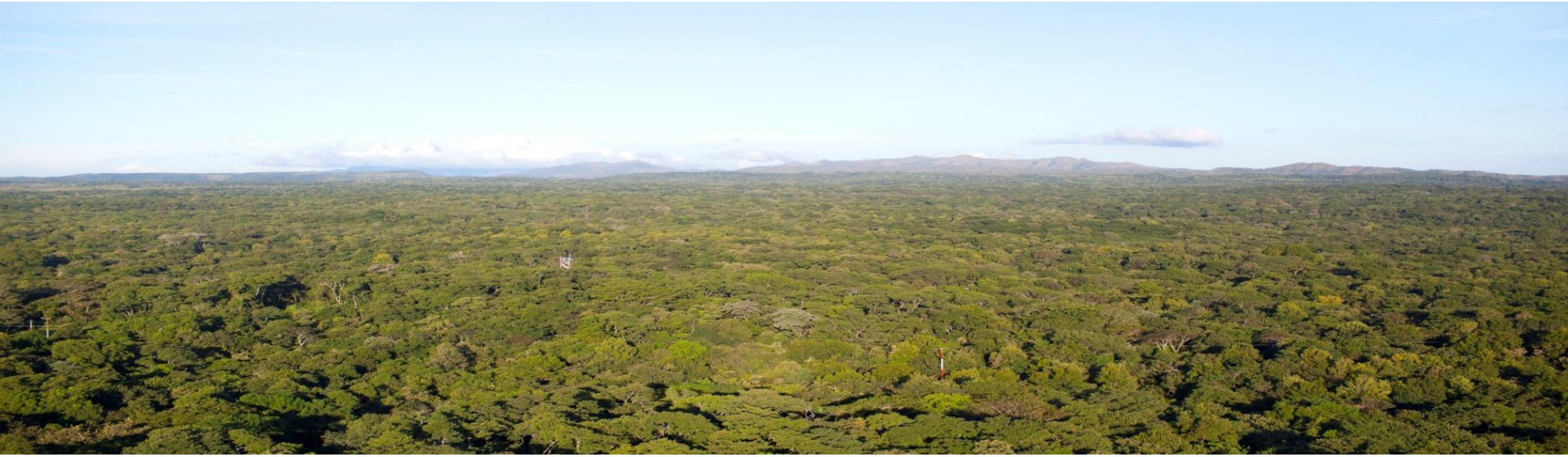
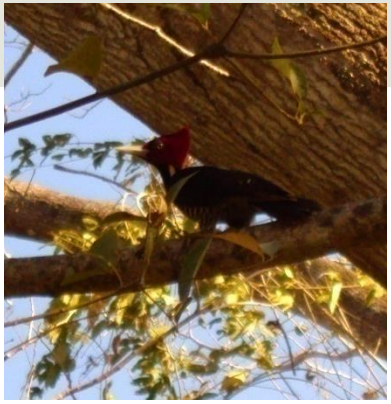
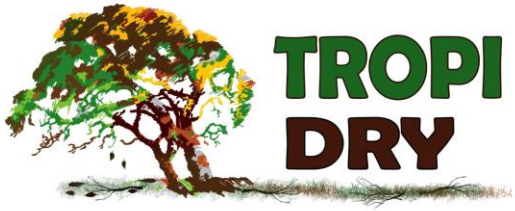
TROPI-DRY



Tropi-Dry: Dimensiones Humanas y Biofisicas de los bosques secos

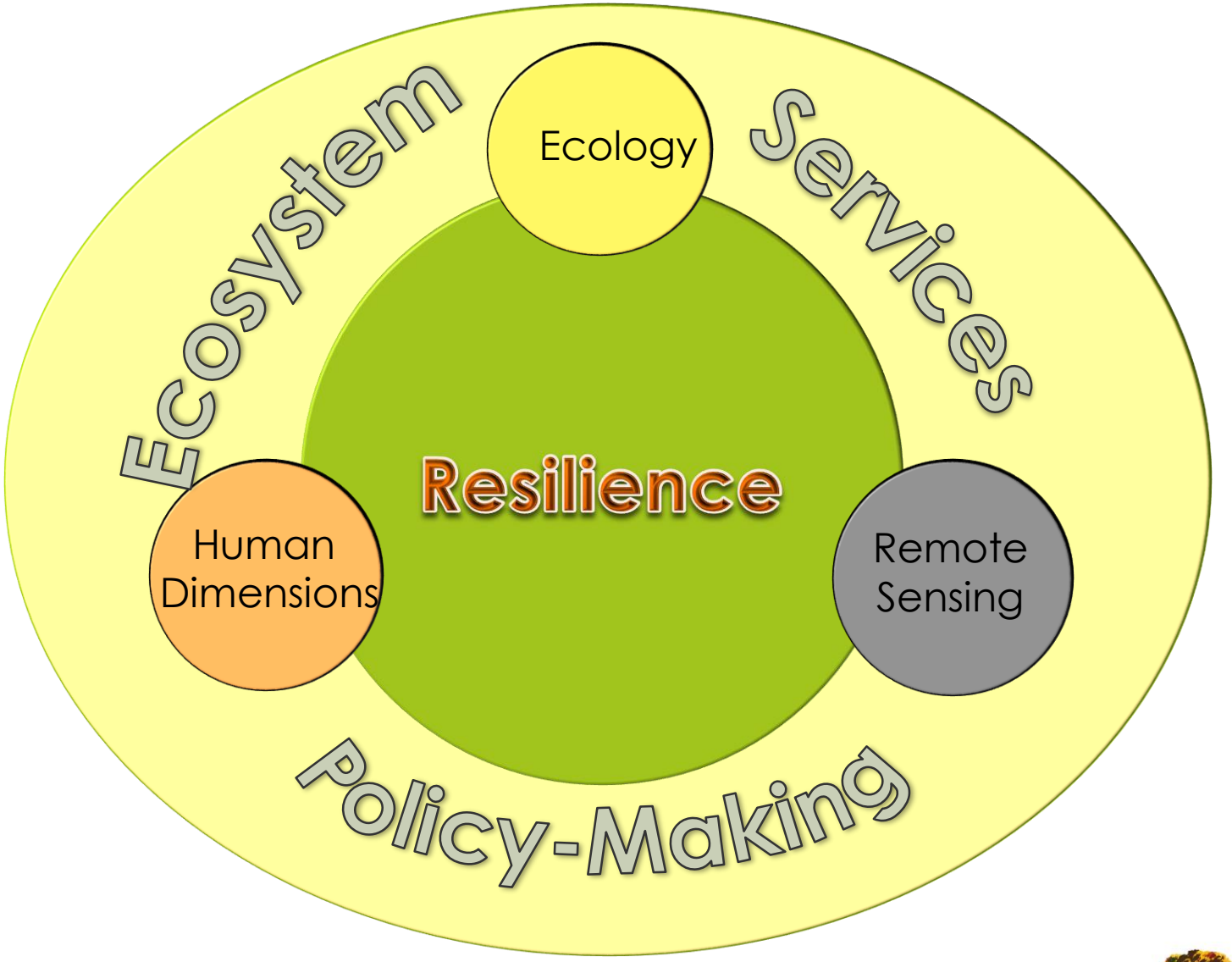




What is tropi-dry?

What's Tropi-Dry?

- **Tropi-Dry:** A project aimed to understand the human and biophysical dimensions of tropical dry forests in the Americas.
- **Participants:** Canada, USA, Costa Rica, Brazil, Colombia, Germany, England.
- **Capacity Building:** >300 students involved since 2005.
- **Impact on Policy Making:** Direct work with policy makers.


Ecosystem Services
Ecology
Resilience
Human Dimensions
Remote Sensing
Policy-Making

The wealth of a country

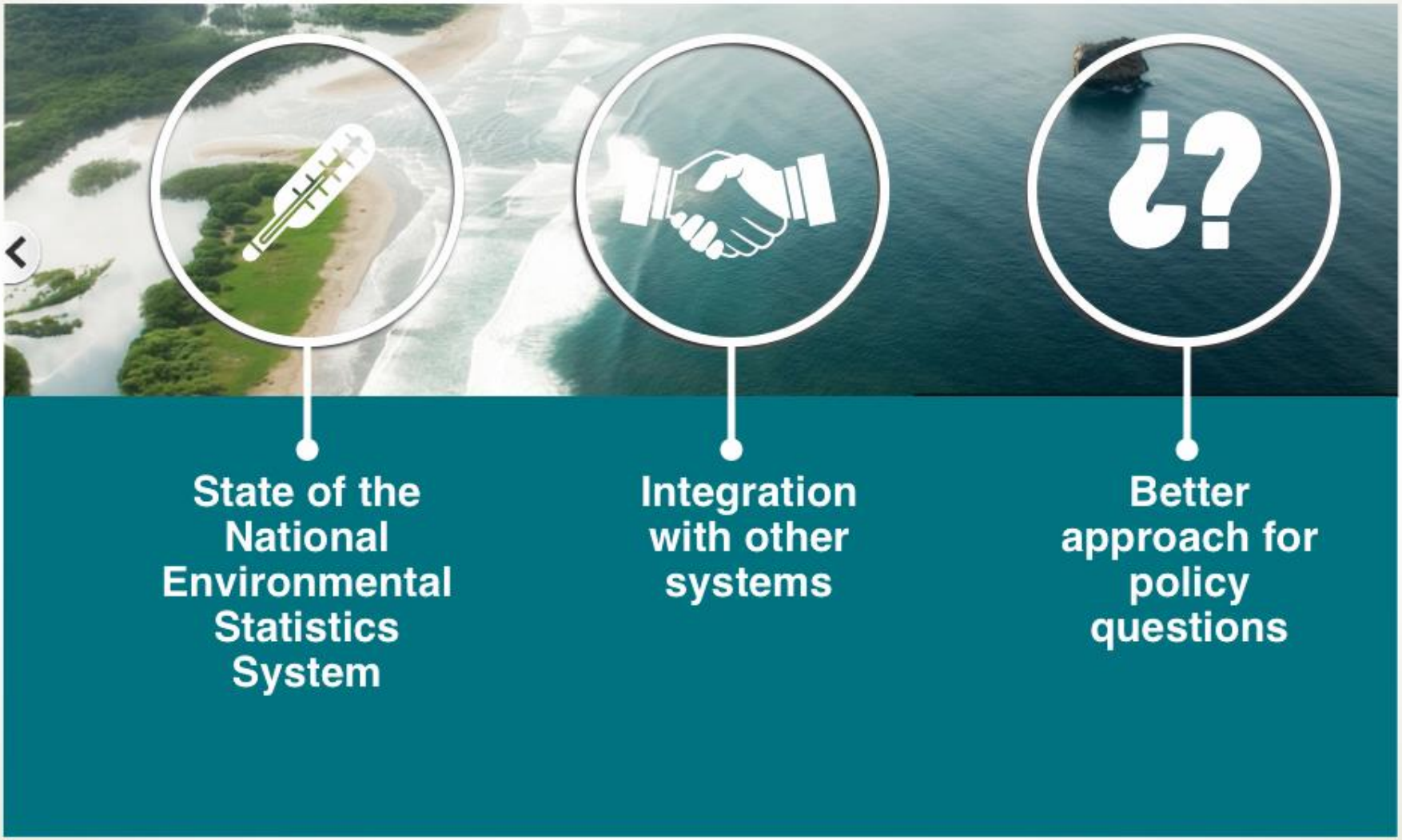
=

total capital

Physical **Intangible** **Natural**

Development
of the environmental accounts

Co-benefits
from environmental accounting

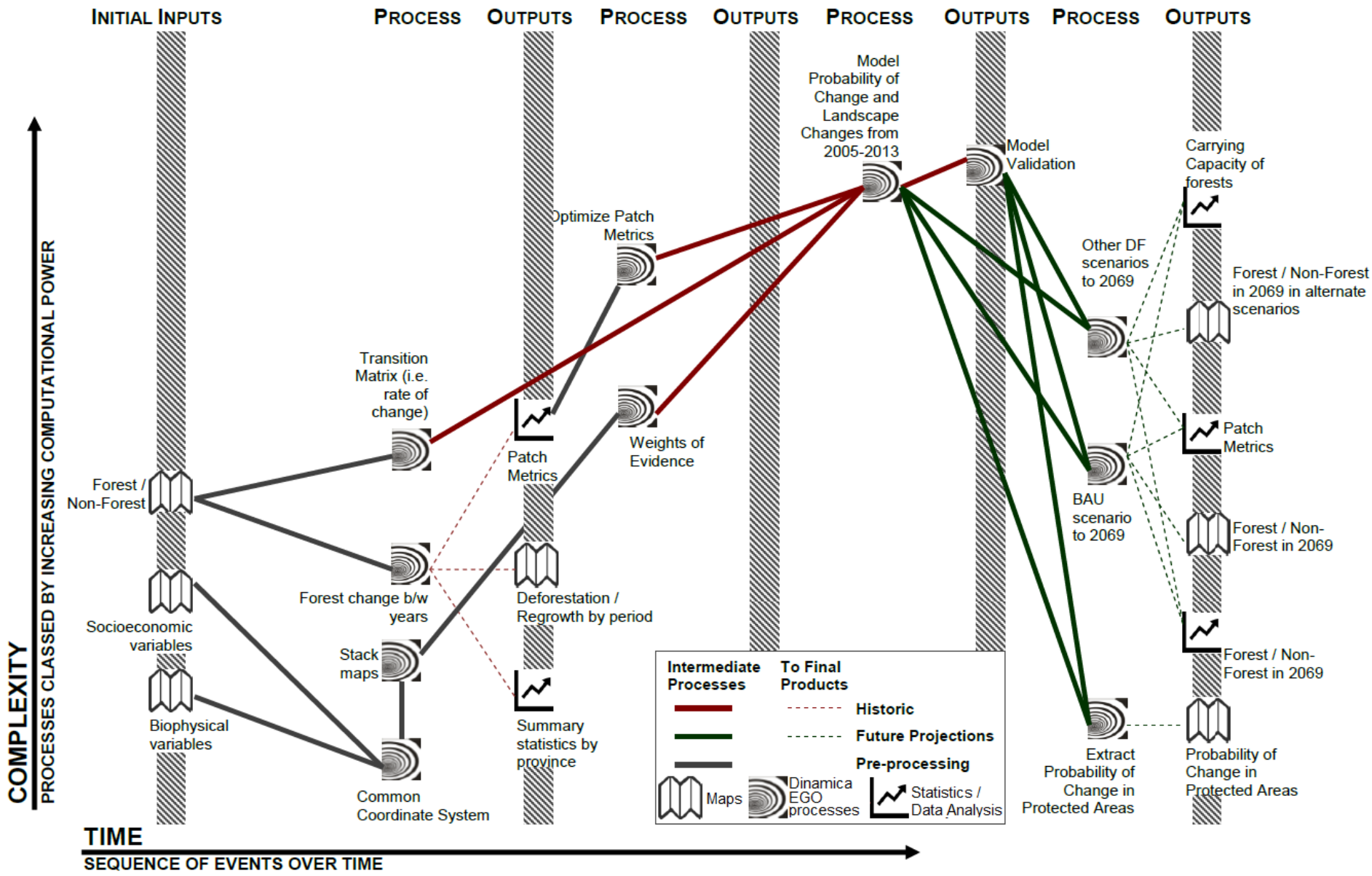


Ejes de discussion:

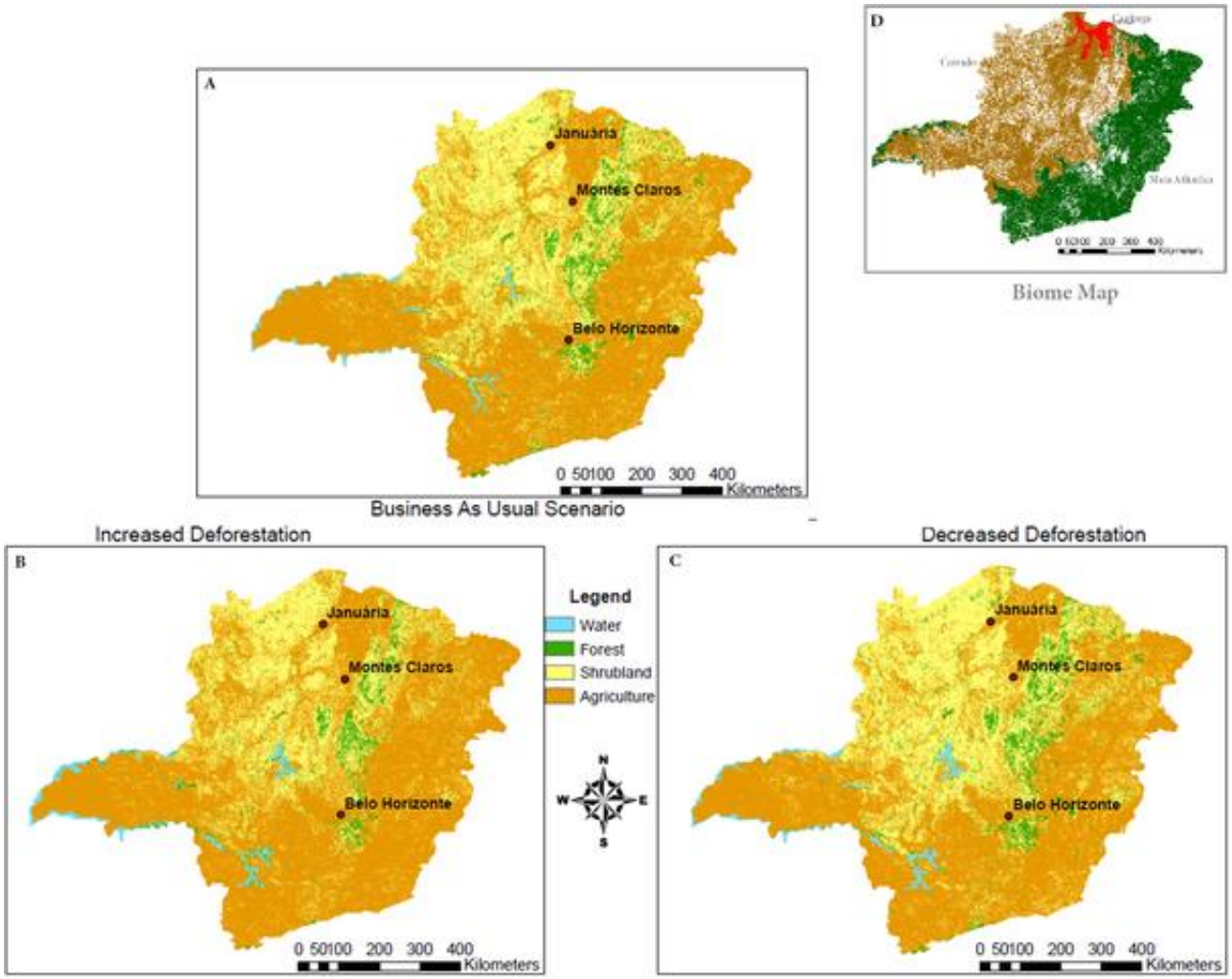
- Biodiversidad.
- Cambio Climatico.
- Matrix Energetica.

Eje de discusion No. 1:

Conservacion de la biodiversidad biologica


INITIAL INPUTS
PROCESS
OUTPUTS
PROCESS
OUTPUTS
PROCESS
OUTPUTS
PROCESS
OUTPUTS
COMPLEXITY
PROCESSES CLASSED BY INCREASING COMPUTATIONAL POWER
TIME
SEQUENCE OF EVENTS OVER TIME
Forest / Non-Forest
Socioeconomic variables
Biophysical variables
Transition Matrix (i.e. rate of change)
Forest change b/w years
Stack maps
Common Coordinate System
Optimize Patch Metrics
Patch Metrics
Weights of Evidence
Deforestation / Regrowth by period
Summary statistics by province
Model Probability of Change and Landscape Changes from 2005-2013
Model Validation
Other DF scenarios to 2069
BAU scenario to 2069
Extract Probability of Change in Protected Areas
Carrying Capacity of forests
Forest / Non-Forest in 2069 in alternate scenarios
Patch Metrics
Forest / Non-Forest in 2069
Forest / Non-Forest in 2069
Probability of Change in Protected Areas
Intermediate Processes
To Final Products
Historic
Future Projections
Pre-processing
Maps
Dinamica EGO processes
Statistics / Data Analysis

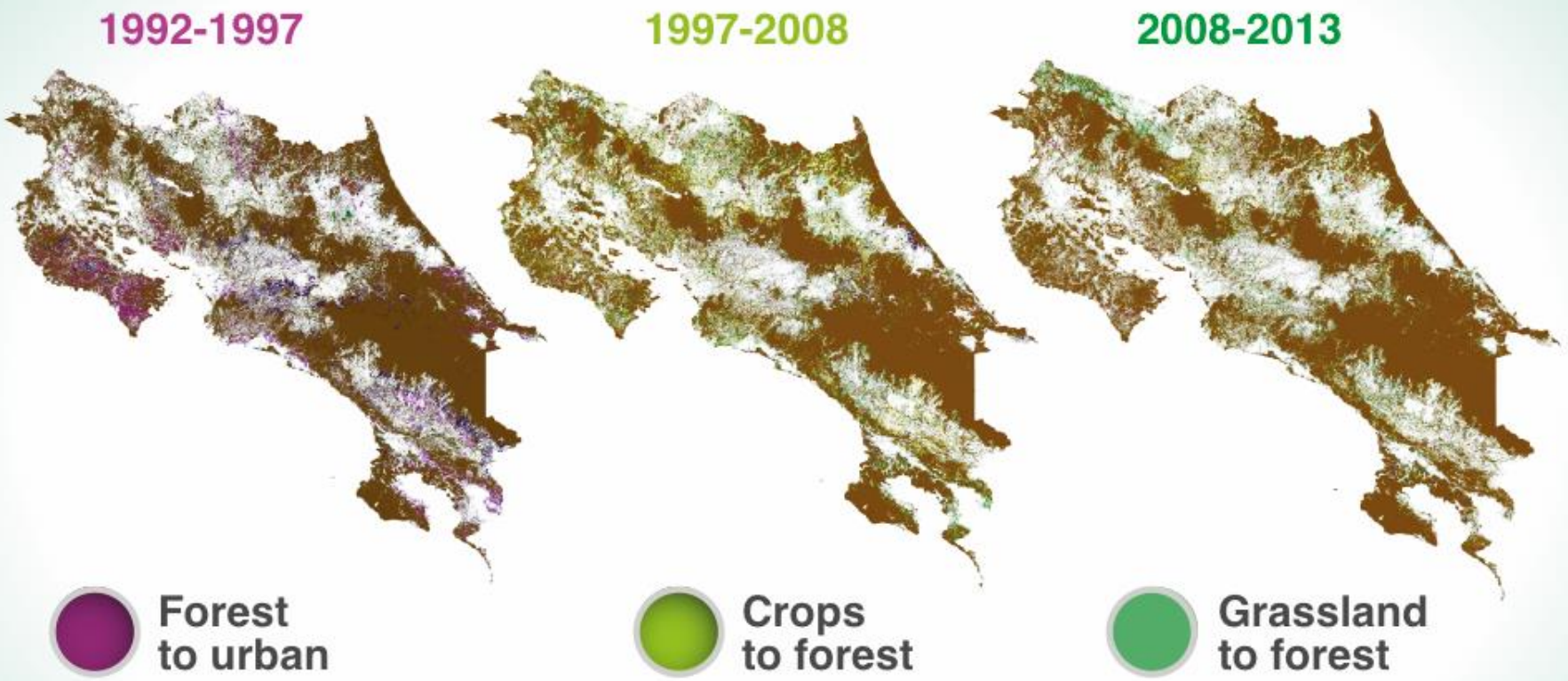
Results from Dinamica EGO model simulation showing the landscape composition for the year 2015.



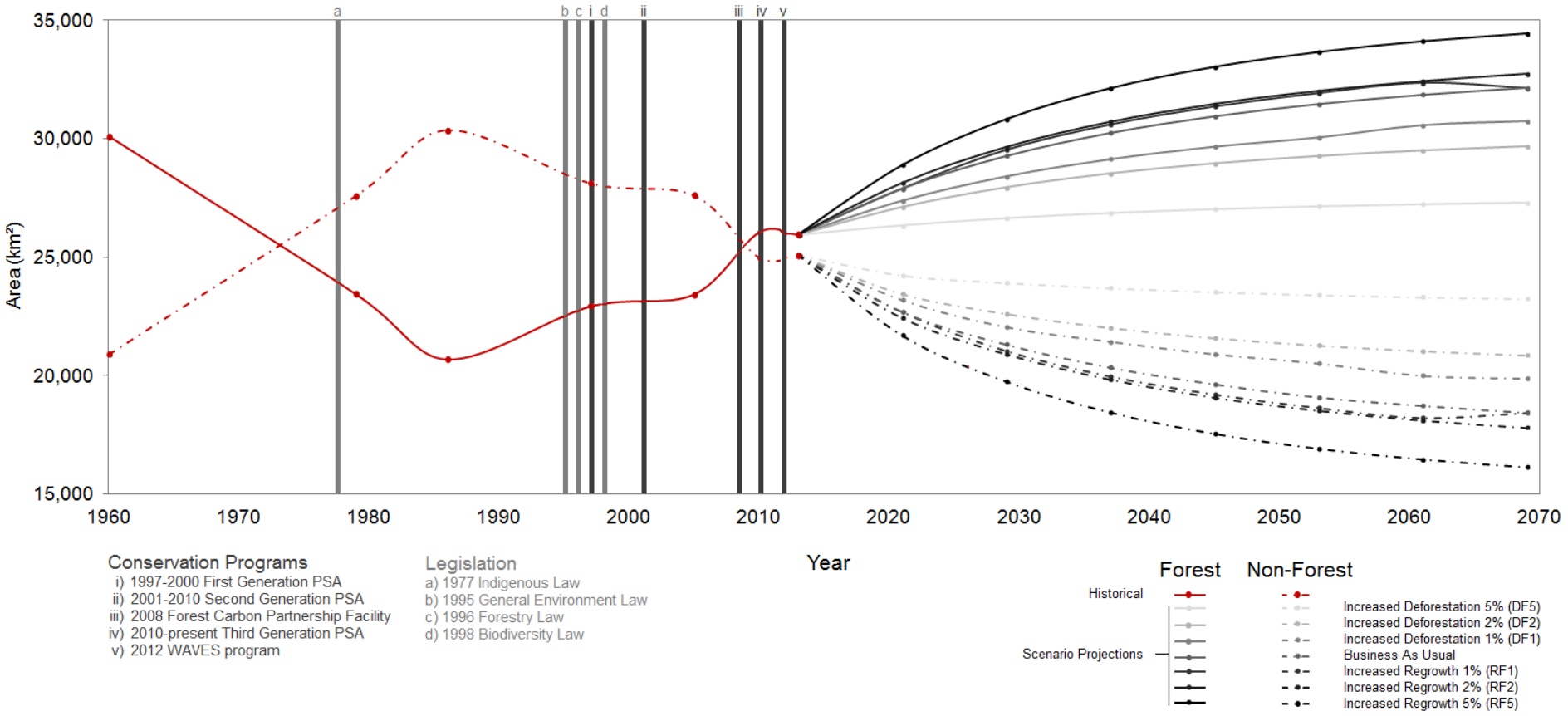
Stan K, Sanchez-Azofeifa A, Espírito-Santo M, Portillo-Quintero C (2015) Simulating Deforestation in Minas Gerais, Brazil, under Changing Government Policies and Socioeconomic Conditions. PLOS ONE 10(9): e0137911. https://doi.org/10.1371/journal.pone.0137911
http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0137911

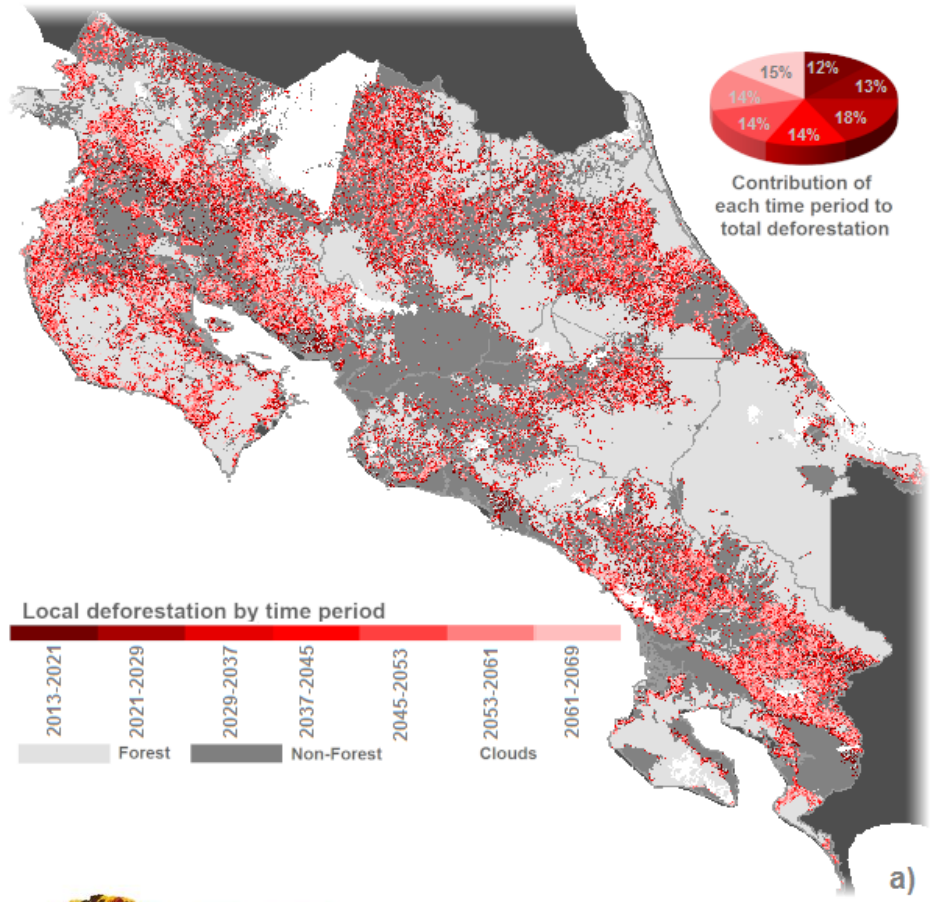
FOREST accounts

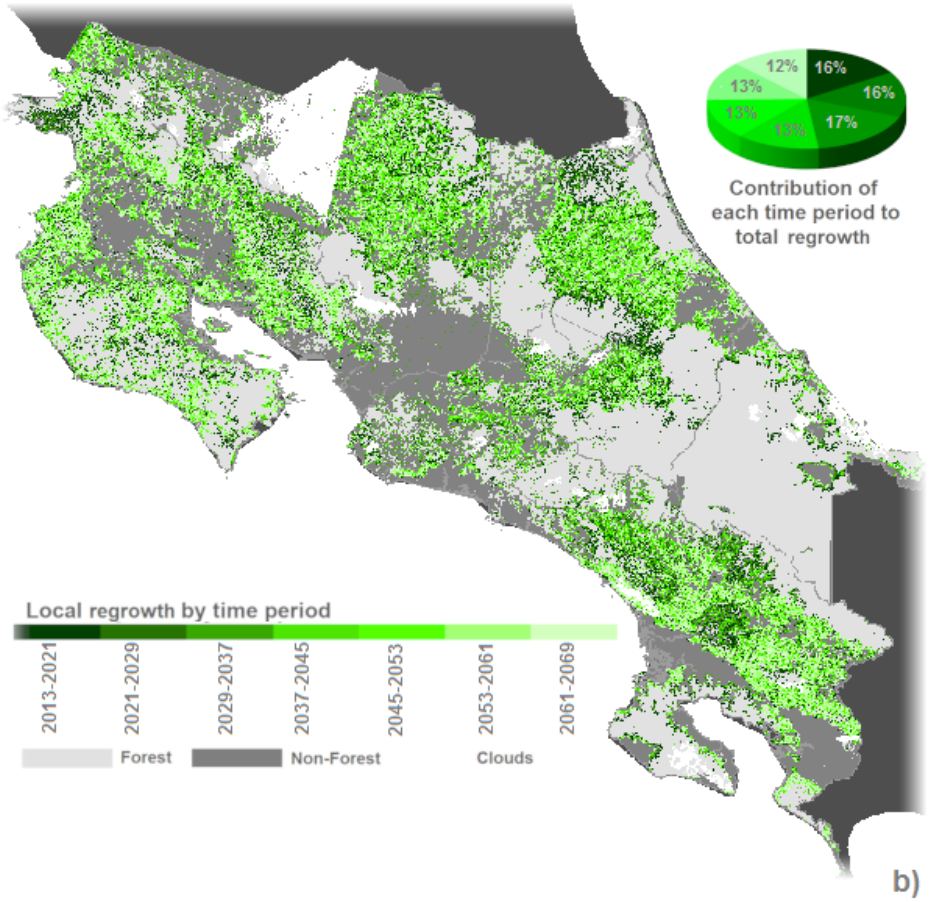
Forest transition
to and/or from other land uses



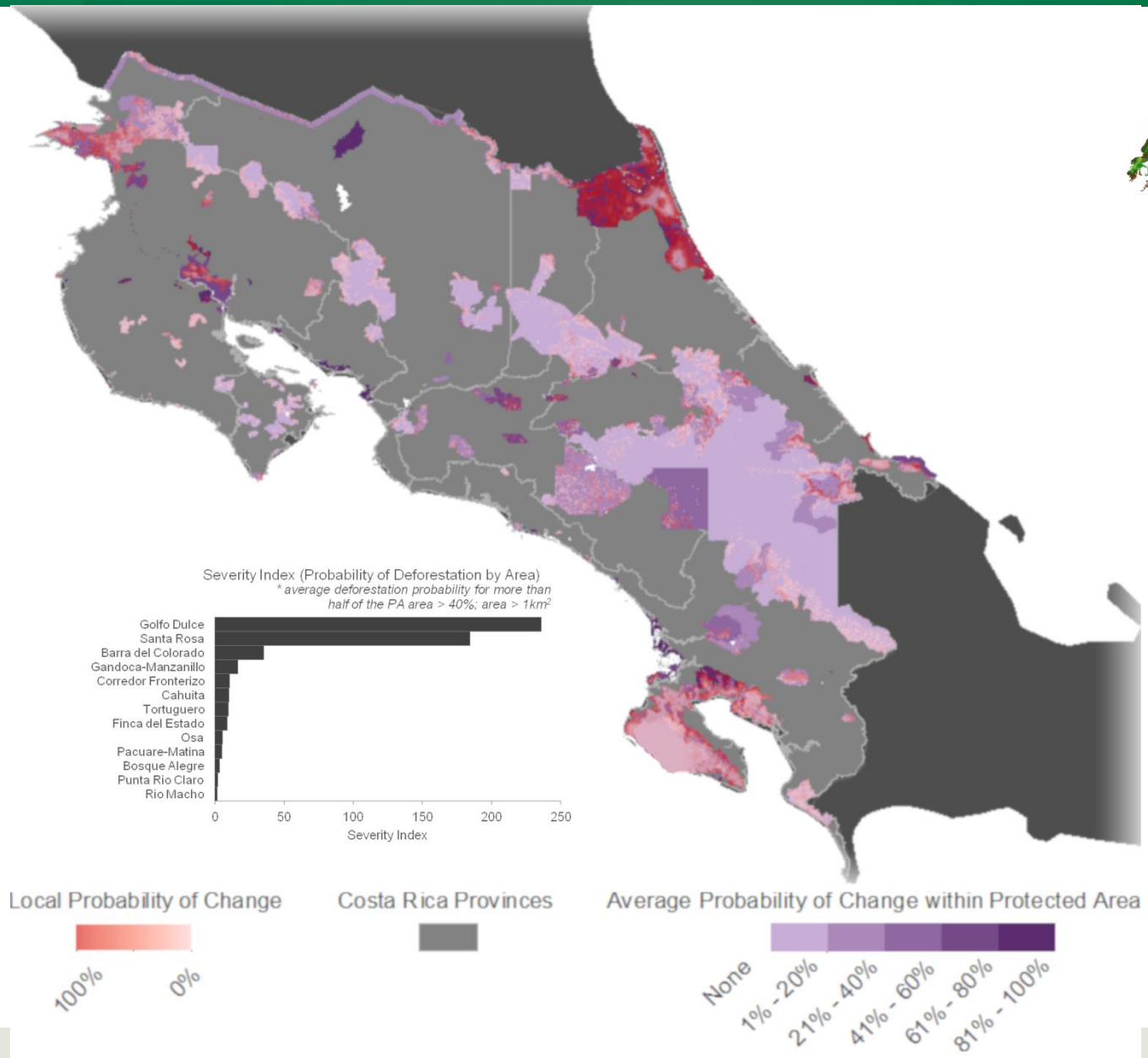
Other changes or no data
Forest to forest
Forest plantation to forest
Urban to forest
Grassland to forest
Water to forest
Crops to forest
Forest to forest plantation
Forest to urban
Forest to grassland
Forest to water
Forest to crops


a
b c i d
ii
iii iv v
35,000
30,000
25,000
20,000
15,000
Area (km²)
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
2060
2070
Year
Conservation Programs
i) 1997-2000 First Generation PSA
ii) 2001-2010 Second Generation PSA
iii) 2008 Forest Carbon Partnership Facility
iv) 2010-present Third Generation PSA
v) 2012 WAVES program
Legislation
a) 1977 Indigenous Law
b) 1995 General Environment Law
c) 1996 Forestry Law
d) 1998 Biodiversity Law
Forest
Non-Forest
Historical
Scenario Projections
Increased Deforestation 5% (DF5)
Increased Deforestation 2% (DF2)
Increased Deforestation 1% (DF1)
Business As Usual
Increased Regrowth 1% (RF1)
Increased Regrowth 2% (RF2)
Increased Regrowth 5% (RF5)


15%
12%
13%
14%
18%
14%
14%
Contribution of each time period to total deforestation
Local deforestation by time period
2013-2021
2021-2029
2029-2037
2037-2045
2045-2053
2053-2061
2061-2069
Forest
Non-Forest
Clouds
a)

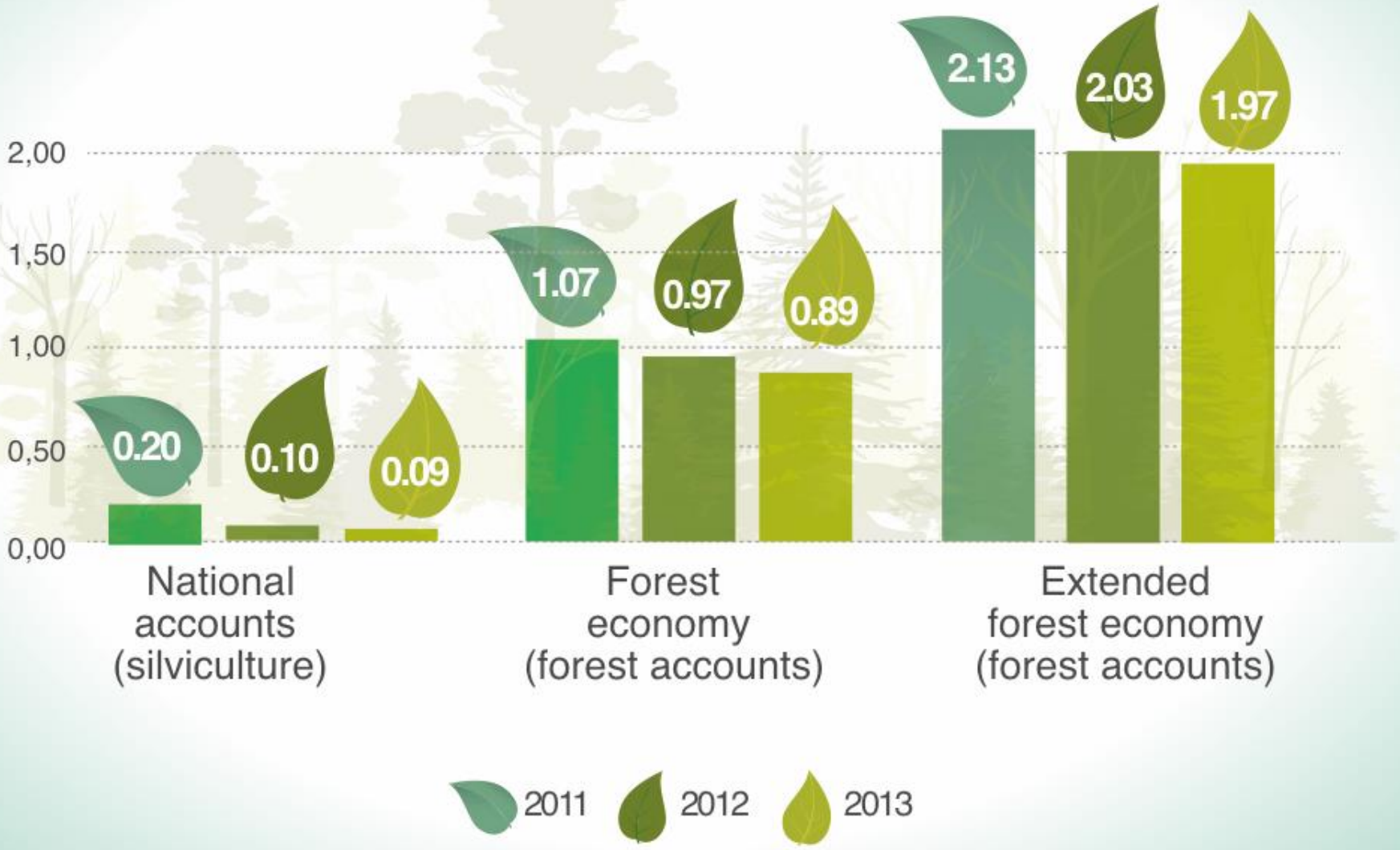

12%
16%
13%
16%
17%
13%
Contribution of each time period to total regrowth
Local regrowth by time period
2013-2021
2021-2029
2029-2037
2037-2045
2045-2053
2053-2061
2061-2069
Forest
Non-Forest
Clouds
b)

TROPI DRY


Severity Index (Probability of Deforestation by Area)
* average deforestation probability for more than half of the PA area > 40%; area > 1km²
Golfo Dulce
Santa Rosa
Barra del Colorado
Gandoca-Manzanillo
Corredor Fronterizo
Cahuita
Tortuguero
Finca del Estado
Osa
Pacuare-Matina
Bosque Alegre
Punta Rio Claro
Rio Macho
0
50
100
150
200
250
Severity Index
Local Probability of Change
100%
0%
Costa Rica Provinces
Average Probability of Change within Protected Area
None
1% - 20%
21% - 40%
41% - 60%
61% - 80%
81% - 100%

Forests contribution to GDP

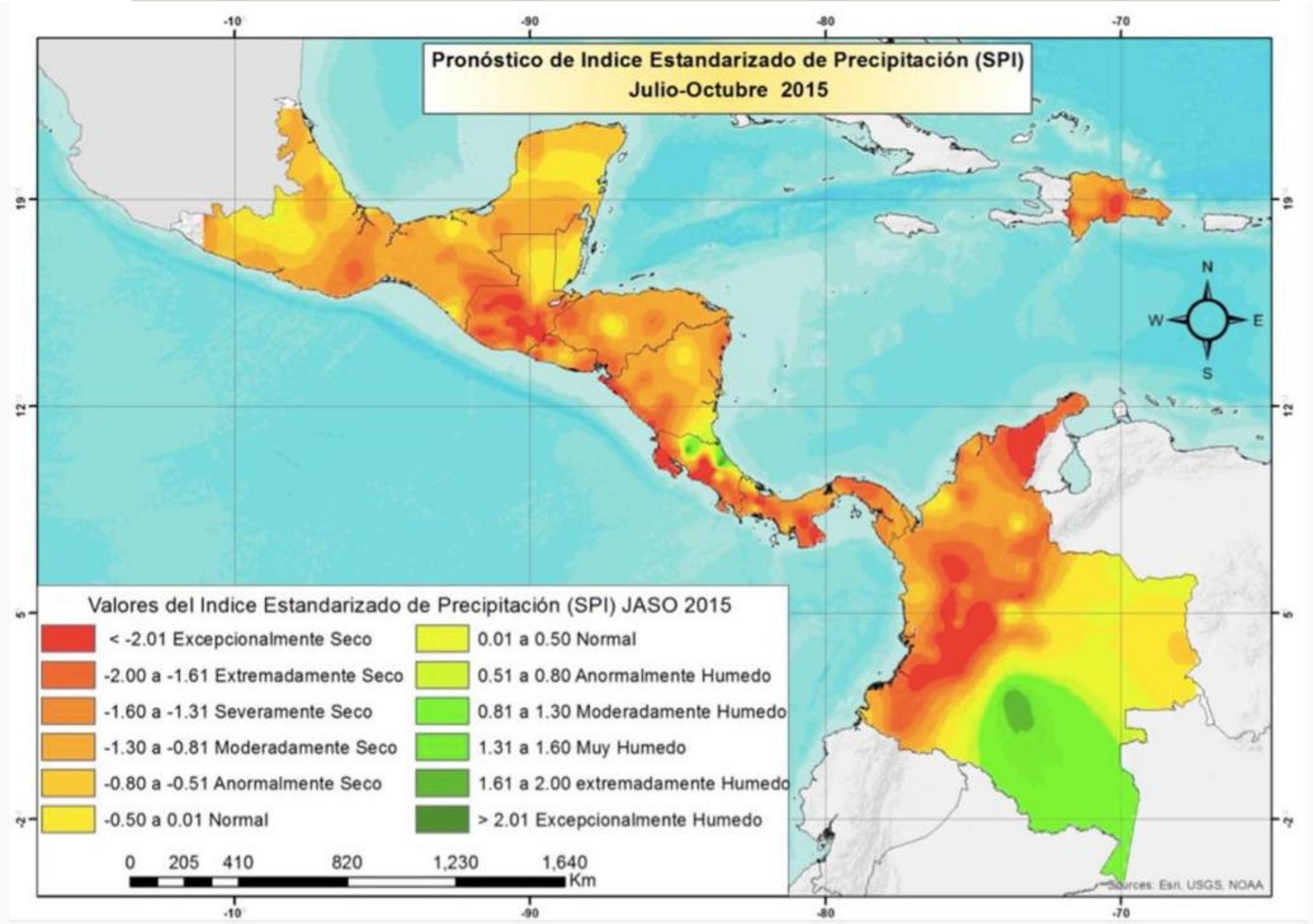
(percentage)



Eje de discusion No. 2:

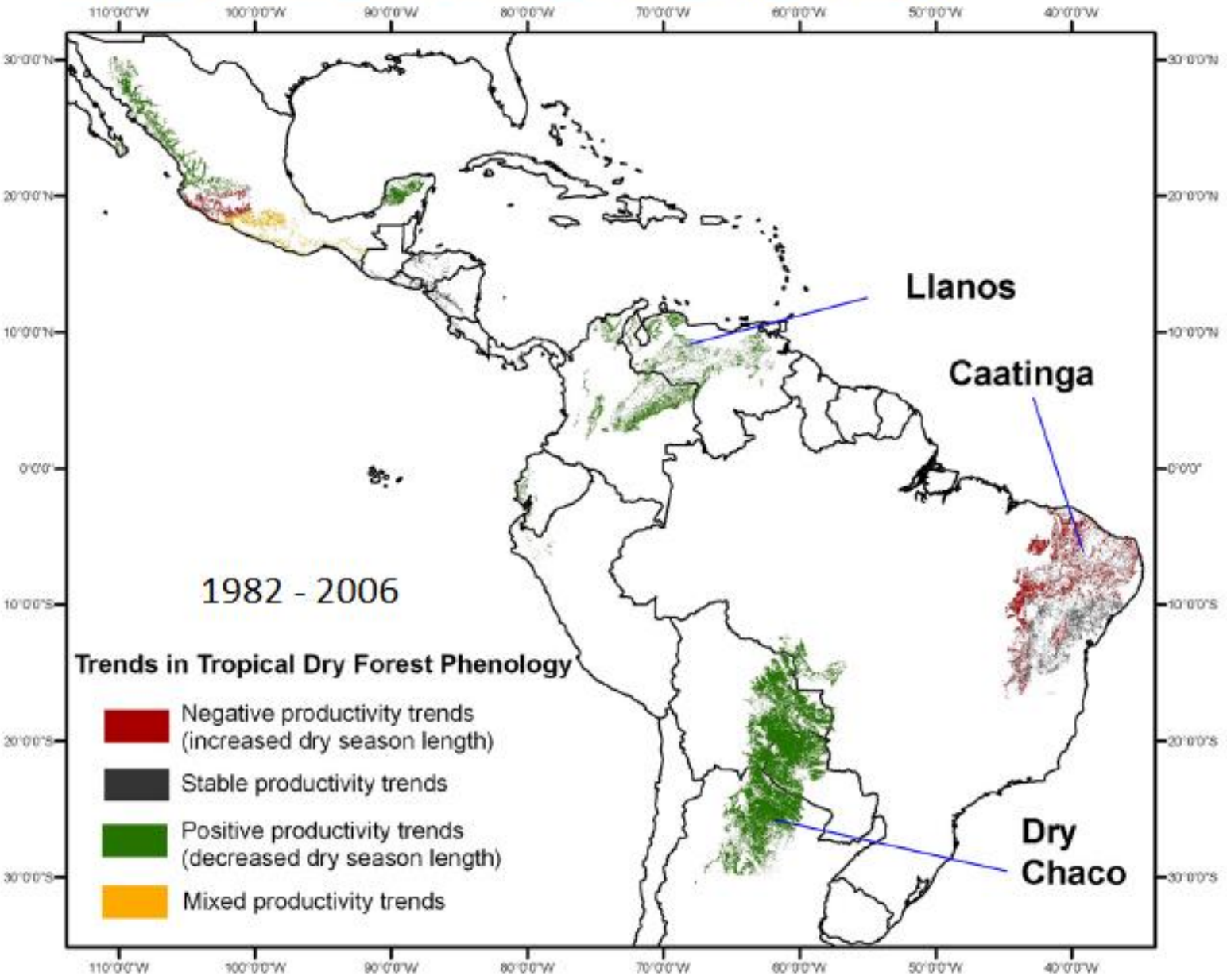
Cambio Climatico


DROUGHT!


Pronóstico de Indice Estandarizado de Precipitación (SPI)
Julio-Octubre 2015
-10
-90
-80
-70
19
12
5
-2
N
W
E
S
Valores del Indice Estandarizado de Precipitación (SPI) JASO 2015
< -2.01 Excepcionalmente Seco
-2.00 a -1.61 Extremadamente Seco
-1.60 a -1.31 Severamente Seco
-1.30 a -0.81 Moderadamente Seco
-0.80 a -0.51 Anormalmente Seco
-0.50 a 0.01 Normal
0.01 a 0.50 Normal
0.51 a 0.80 Anormalmente Humedo
0.81 a 1.30 Moderadamente Humedo
1.31 a 1.60 Muy Humedo
1.61 a 2.00 extremadamente Humedo
> 2.01 Excepcionalmente Humedo
0 205 410 820 1,230 1,640
Km
Sources: Esri, USGS, NOAA

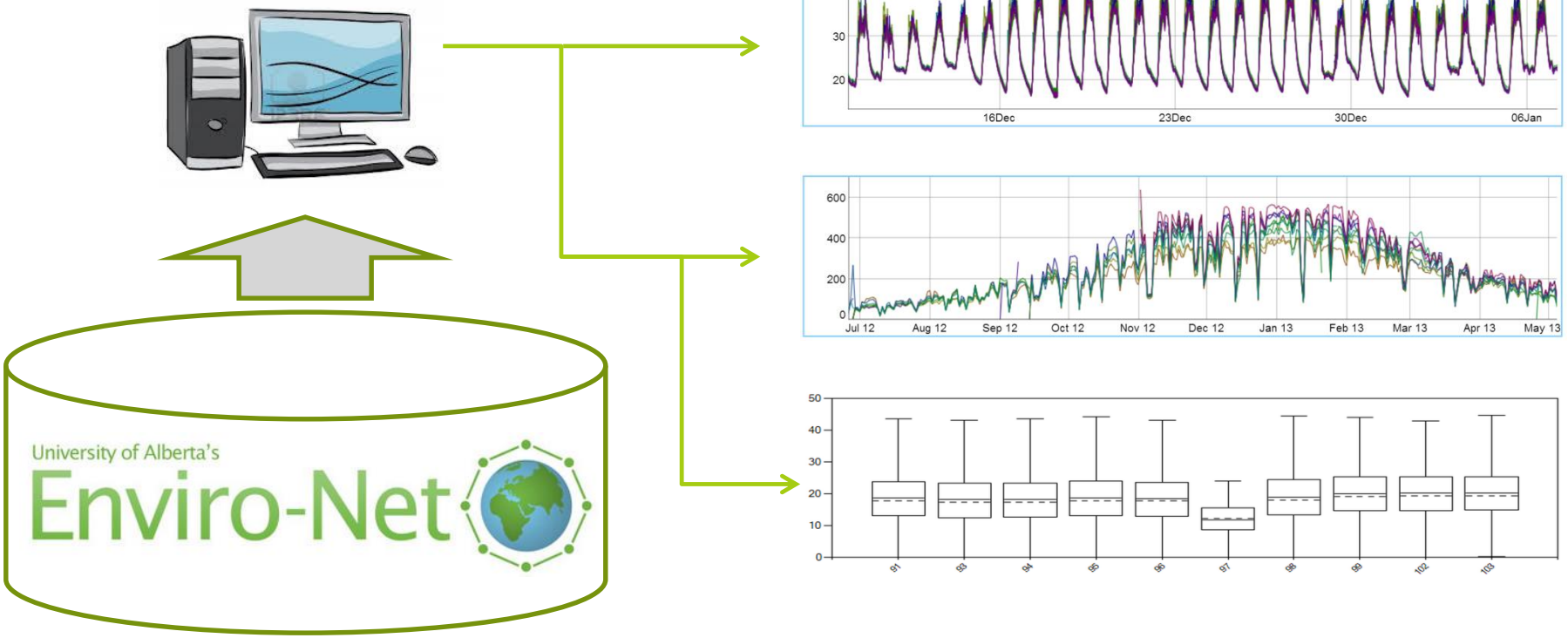
Gains and losses

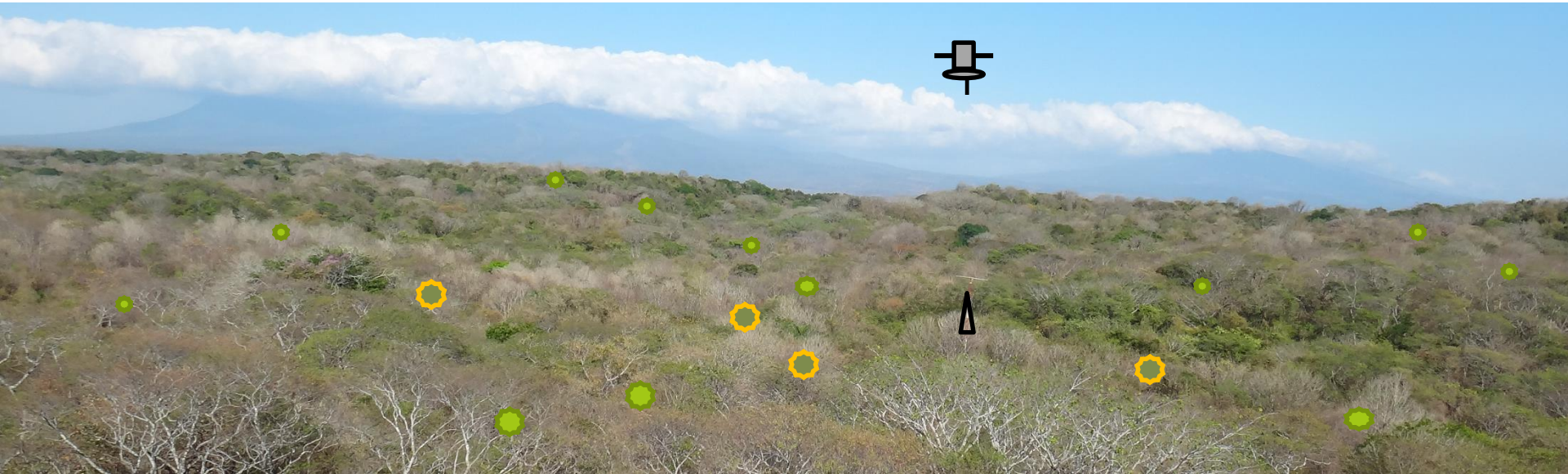
Tropical dry forests are vulnerable under global change

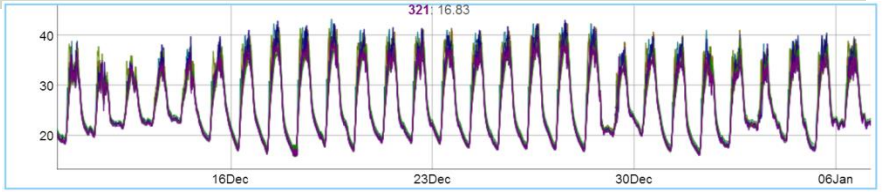


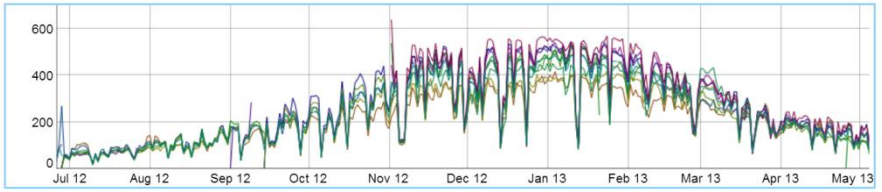
Santa Rosa National Park, Dry Forest Environmental Monitoring Super Site, Guanacaste, Costa Rica:

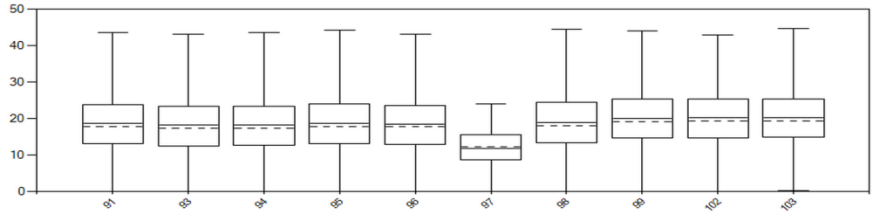
- 3 million data points/year
- CO_2/H_20 fluxes (vegetation and soil)
- Hyperspectral canopy observations
- Wireless Sensor Networks
- On-line/Real time communication via satellite technology
- Drone research
- Micro-Satellite testing site (AlbertaSat)
- Atmospheric Sounding calibration site
- NASA Calibration/Validation site
- Airborne and ground-based LiDAR


University of Alberta's
Enviro-Net
321: 16.83
40
30
20
16Dec
23Dec
30Dec
06Jan
600
400
200
0
Jul 12
Aug 12
Sep 12
Oct 12
Nov 12
Dec 12
Jan 13
Feb 13
Mar 13
Apr 13
May 13
50
40
30
20
10
0



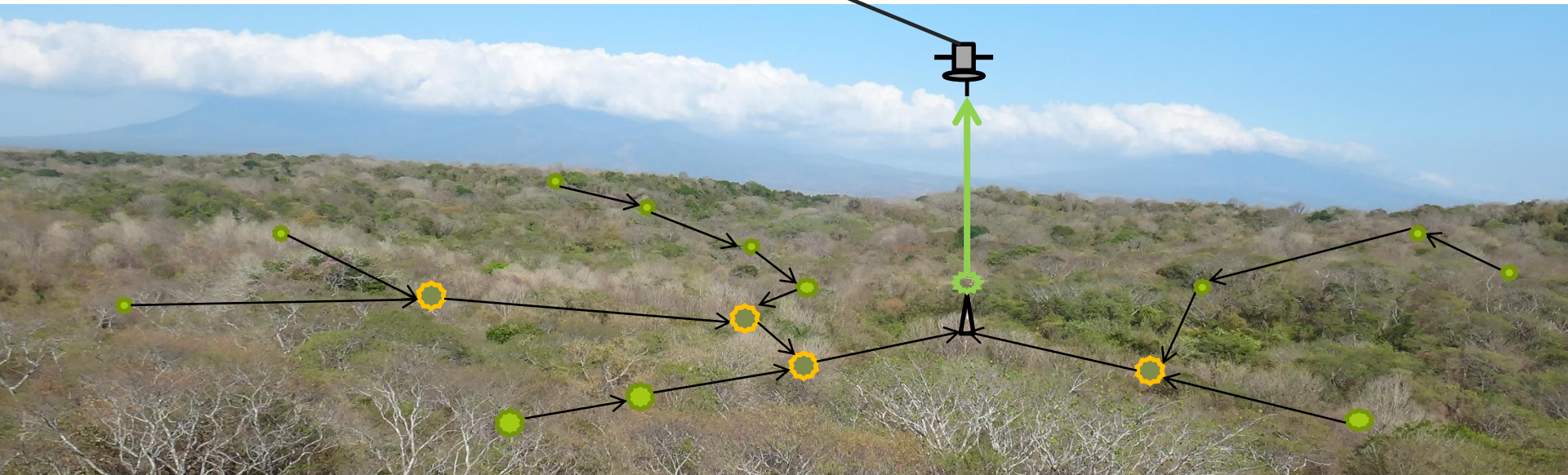






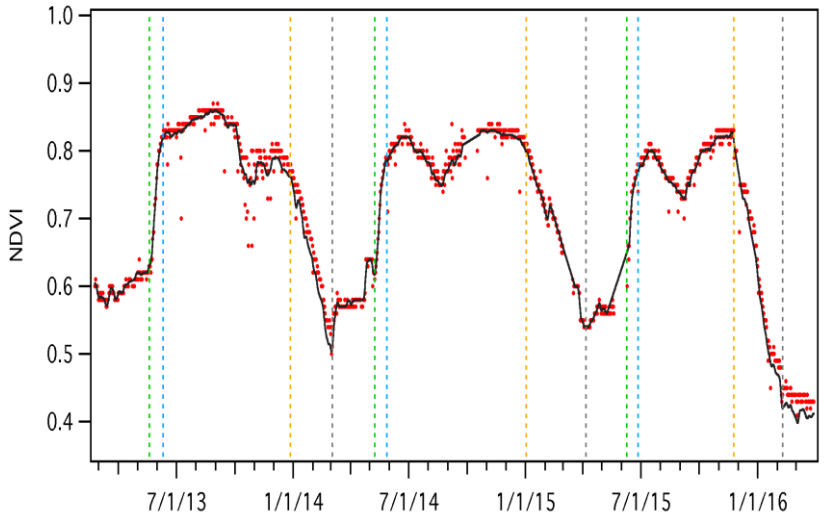
http://www.enviro-net.org/

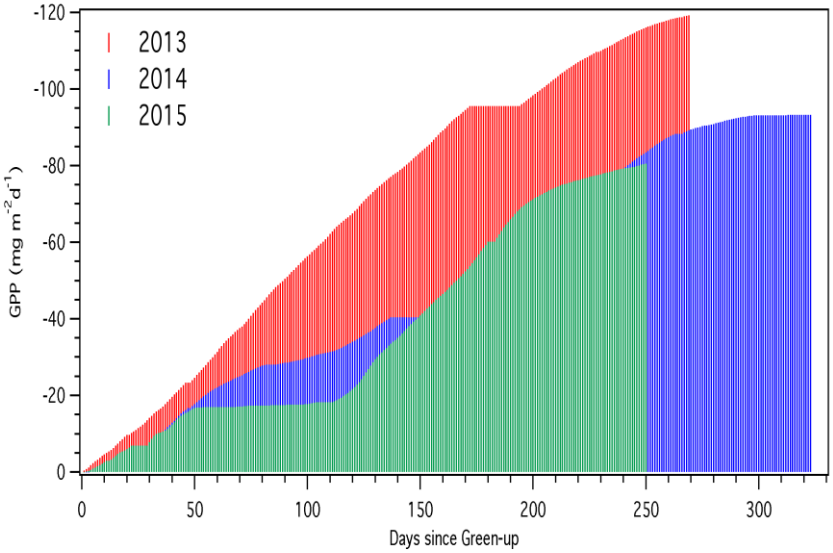
University of Alberta's Enviro-Net



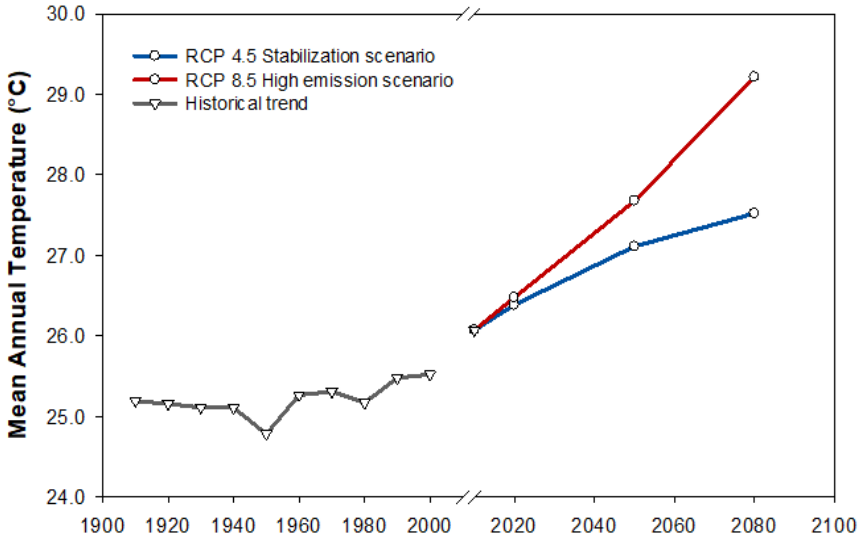
Some fundamental scientific questions for Latin America

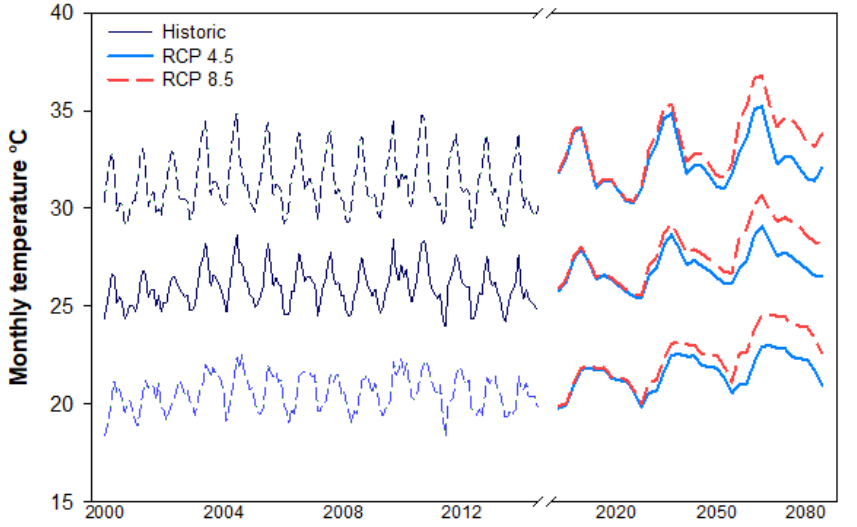
- How tropical ecosystems are responding in terms of carbon sequestration
  - Are they sequestering more? Releasing more? Gaining?
  - How we can predict changes in real time?
- How this relate to phenology?
  - Longer or shorter growing seasons?
- How we integrate these changes on carbon accounting mechanisms?

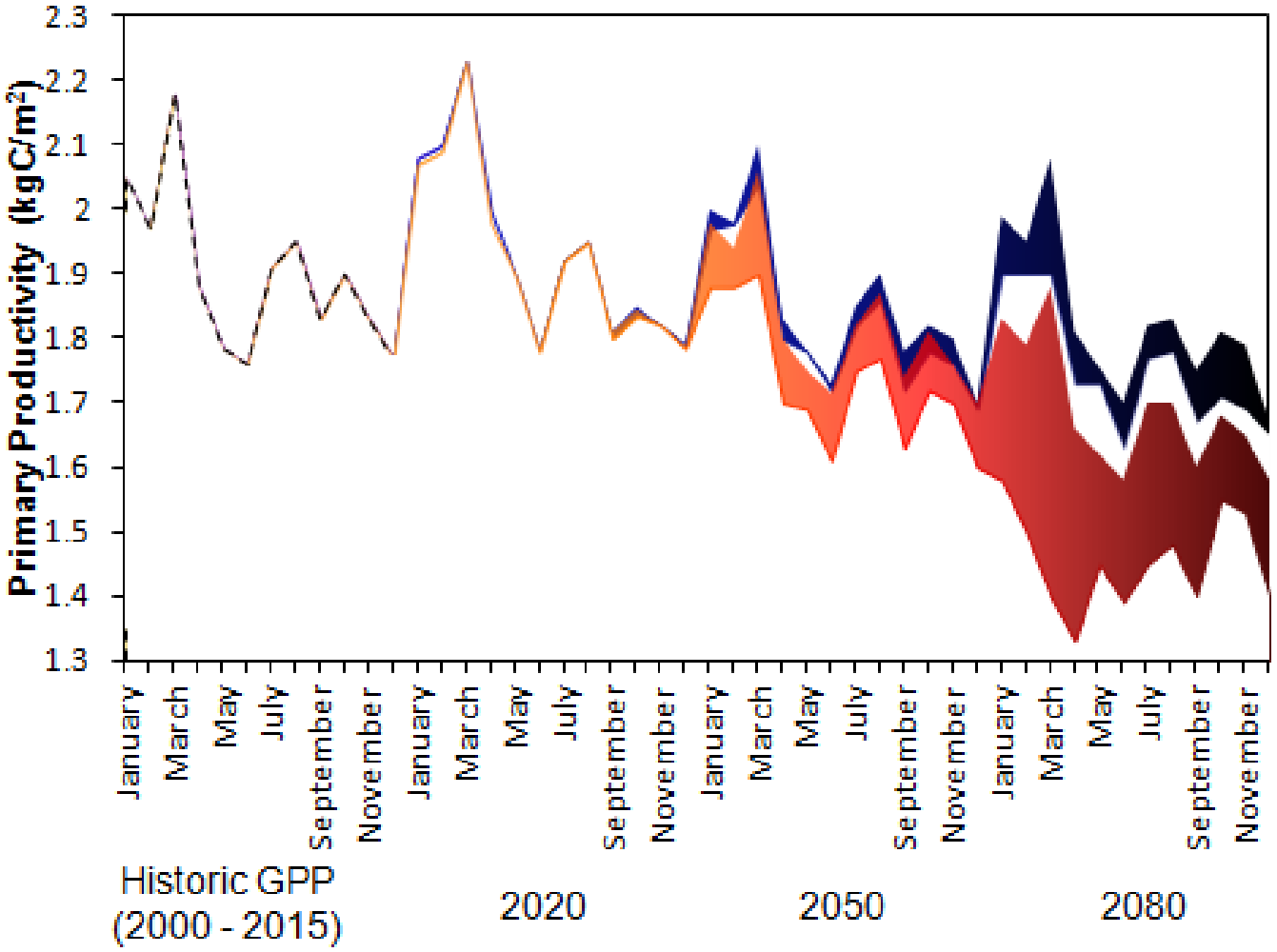





Nicaragua
Costa Rica
Panama
Colombia
LA CRUZ
LIBERIA
BAGACES
TILARAN
CANAS
FILADELFIA
SANTA CRUZ
JUNTAS
NICOYA
HOJANCHA
CARMONA
Legend
Guancaste
Towns
Major Cities
Roads
Primary
Secondary
Land Cover
Water
No Forest
Secondary Forest
Forests
Plantations


Mean Annual Temperature (°C)
RCP 4.5 Stabilization scenario
RCP 8.5 High emission scenario
Historical trend
30.0
29.0
28.0
27.0
26.0
25.0
24.0
1900
1920
1940
1960
1980
2000
2020
2040
2060
2080
2100

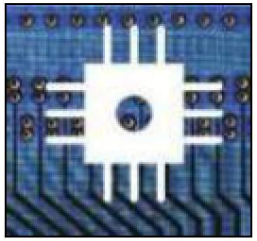

Monthly temperature °C
Historic
RCP 4.5
RCP 8.5
40
35
30
25
20
15
2000
2004
2008
2012
2020
2050
2080



By 2080 there is up to a 23% decrease in the GPP for the whole province in the 8.5 emission scenario. The 4.5 scenario results in a decrease around 10% by 2080. Both scenarios show an overall decrease in the productivity of Guanacaste.

Que nos espera en el futuro?

Enviro-Net.org: Smart tools for smart decision making



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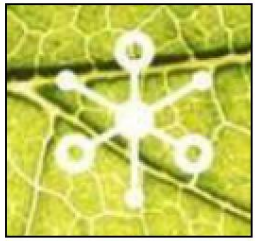

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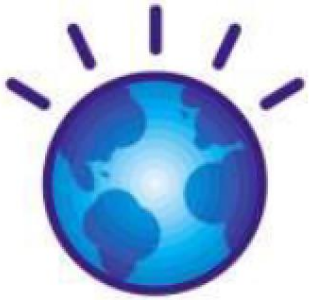

INSTRUMENTED

Forests can be fully Instrument at all levels

INTERCONNECTED

Monitoring systems can be interconnected in entirely new ways

INTELLIGENT

Intelligent interaction is possible with external elements

SMARTER

Information is shared to improve decision making on conservation and management

Muchas Gracias!